

Global Disease Detection Program



Monitoring and Evaluation Report 2006 – 2008



**U.S. Department of
Health and Human Services**
Centers for Disease
Control and Prevention

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Foreword

Scarcely a week goes by without a grim reminder in the media of infectious disease emergence or re-emergence in the United States and around the world. As demonstrated with the SARS outbreak in 2003, a disease threat in one country is a threat to all countries, and the world must have effective prevention and control measures.

Because global health security is considered vitally important by countries around the world, all 194 member states of the World Health Organization (WHO) signed the revised 2005 International Health Regulations (IHR). The IHR directs member states to collaborate with each other to detect, assess, and respond to public health emergencies and maintain certain core capacities. Experts are concerned, however, that many developing countries will not be able to comply with the basic obligations in the IHR by the 2012 deadline. Such an outcome would hinder efforts to improve global public health security in the long term, and in the short term present an important security threat to the United States.

The Global Disease Detection (GDD) program, funded by the U.S. Congress in 2004, protects Americans and others throughout the world from emerging infectious diseases by building capacity in outbreak detection and response in partnership with other countries and the WHO. The GDD program is working to close the critical gap between global public health capacity defined in the IHR and the ability of many member states to meet these requirements. GDD unites the resources of United States and its international partners to provide technical assistance, logistical support, and funding through regional networks and intergovernmental organizations.

In 2006, the GDD program implemented a comprehensive monitoring and evaluation framework, which has helped to measure our progress in building capacity to rapidly detect and contain emerging disease threats. This GDD Monitoring and Evaluation Report provides a summary of the accomplishments of the program from 2006 to 2008 and represents the collective achievements of the GDD Regional Centers, other CDC programs, and partners.

Global Disease Detection (GDD) Program

Global Disease Detection (GDD) Program

GDD is CDC’s principal and most visible program for developing and strengthening global capacity to rapidly identify and effectively respond to emerging infections around the world. The program comprises field and CDC headquarters components.

GDD Regional Centers: A central focus of GDD is establishing and expanding GDD Regional Centers, particularly in resource-constrained locations. CDC manages six GDD Regional Centers (see map on pg 3), one in each of the six WHO regions, that are working to develop six critical public health capacities. Each core capacity is led by a program at CDC headquarters.



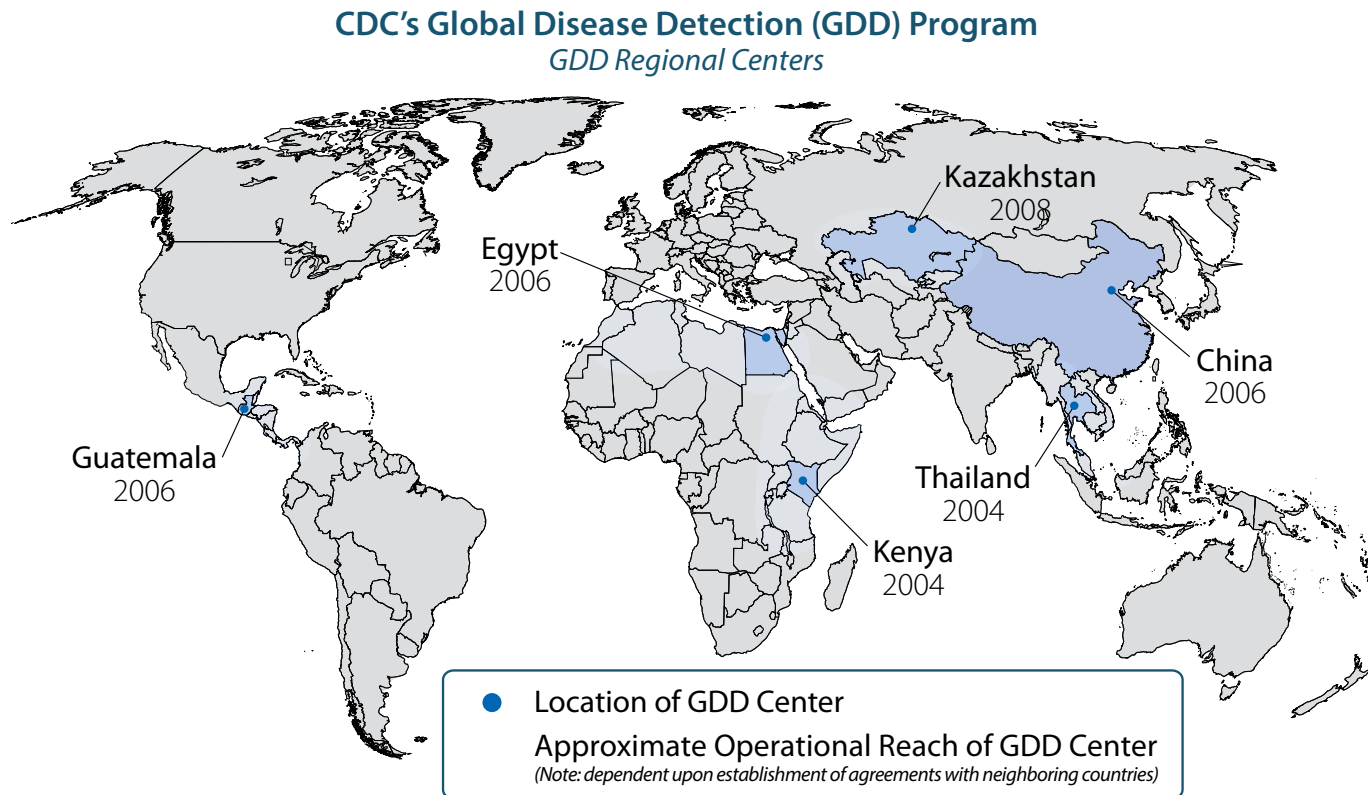
Headquarters Scientific Expertise: CDC is one of the world’s leading public health agencies and the only U.S. government agency that can rapidly access in-depth expertise required to respond to complex disease outbreaks. GDD is connected to a vast array of CDC scientific experts located at CDC headquarters in Atlanta and in more than 50 countries around the world. In addition, GDD provides tactical support through its Technical Supports Corps, a cadre of scientists that provide 24/7 support to GDD Regional Centers and can facilitate aid to the field in the case of prolonged or complex emergencies. Technical Support Corps members collectively possess a wide range of expertise in each of GDD core capacities.

GDD Operations Center: The GDD Operations Center, located at CDC headquarters in Atlanta, provides early warning about international health threats so that CDC can respond rapidly to protect the health of the U.S. population and others throughout the world. The unit is staffed with experts in infectious diseases, veterinary medicine, medical microbiology and epidemiology; information technology; and an emergency coordinator that facilitates deployment of international teams via the CDC Emergency Operations Center. The Operations Center also serves as CDC’s liaison with the Global Outbreak Alert and Response Network (GOARN), receiving and responding to requests for international assistance to control disease outbreaks.

Core Capacity at GDD Centers	Program Lead at CDC Headquarters
Emerging infectious disease detection and response	International Emerging Infections Program, Coordinating Center for Infectious Diseases
Training in field epidemiology and laboratory methods	Field Epidemiology Training Program, Coordinating Office of Global Health
Pandemic influenza preparedness and response	Influenza Division, Coordinating Center for Infectious Diseases
Zoonotic disease research and containment at the human-animal interface	National Center for Zoonotic, Vector-Borne and Enteric Diseases, Coordinating Center for Infectious Diseases
Health communication and information technology	Two Programs: <ul style="list-style-type: none">• National Center for Health Marketing, Coordinating Center for Health Information and Service• Information Technology Services Office, Office of the Director
Laboratory systems and biosafety	Two Programs: <ul style="list-style-type: none">• Division of Laboratory Systems, Coordinating Center for Infectious Diseases• Office of Health and Safety, Office of the Director

Global Disease Detection (GDD) Program

GDD Regional Centers



CDC has six GDD Regional Centers, one in each of the six WHO regions. Placement of Centers is determined by consulting with host countries, internal experts, and national and international partners. Criteria include the following:

- Public health significance
- Established CDC presence
- Established regional scope
- International partner presence

GDD Monitoring and Evaluation (M & E) Framework

GDD routinely monitors and evaluates the program's capabilities and progress using a framework that includes quantitative and qualitative information related to the following five key activities:

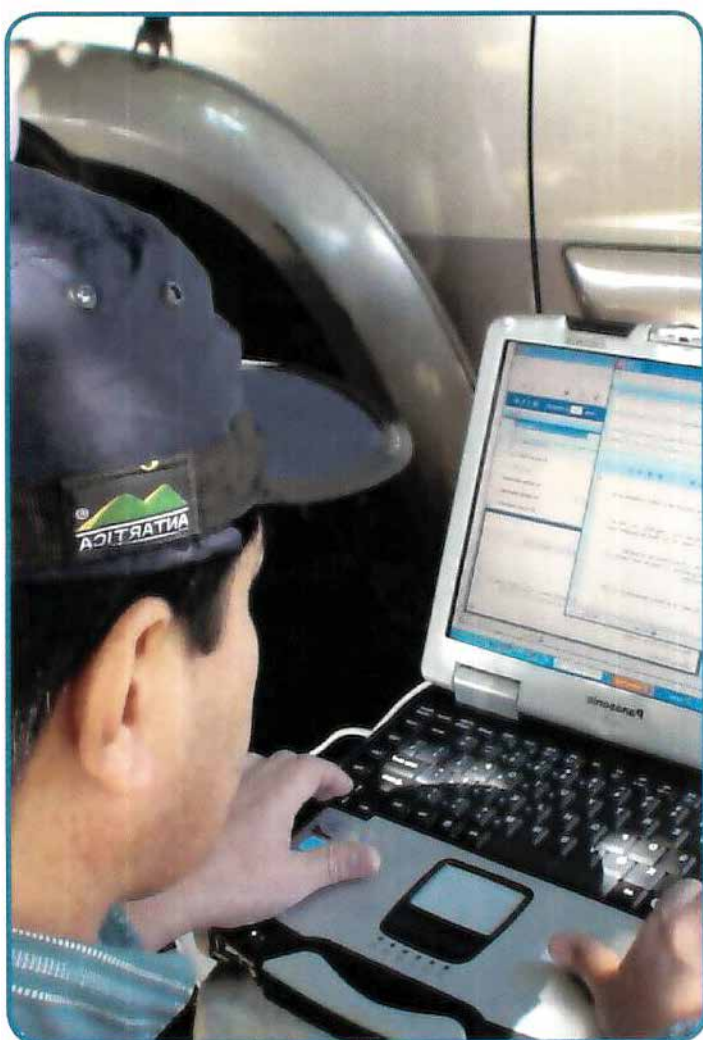
Outbreak Response: Improve the timeliness and reliability of outbreak investigations and responses

Pathogen Discovery: Advance public health knowledge through innovative research into the epidemiology and biology of emerging infections and identify novel threats before they spread

Training: Build capacity and improve the quality of epidemiology and laboratory science through training

Surveillance: Strengthen surveillance systems that are capable of detecting, assessing, and monitoring the occurrence and public health significance of infectious disease threats over time

Networking: Enhance collaboration through shared resources and synergy



GDD Regional Centers and Headquarters Infrastructure

	2004	2006	2008
GDD Regional Centers	2	5	6
GDD Staff Overseas	7	17	33
Locally Employed GDD Staff Overseas	71	263	649
GDD Staff at CDC Headquarters	12	25	30
Total	90	305	712

M&E data from 2006 to 2008 was captured annually. Beginning in 2009, M & E data will be collected on a quarterly reporting schedule.

Summary of GDD Accomplishments: 2006-2008

GDD Activity Areas		2006	2007	2008	Cumulative
Outbreak Response	Outbreak Responses:	147	105	95	347
	For which response time was within 24 hours		80	81	161 (81%)
	For which GDD Lab Support was provided	14	27	39	80 (23%)
	For which GDD Lab Confirmation was provided (for those that provided Lab Support)	6	24	33	63 (79%)
	For which GDD Communications Support was provided		7	21	28 (14%)
	For which epidemiological activities led to control of the outbreak		23	38	61 (31%)
	That included CDC-HQ in response activities*		22	11	33 (17%)
	That involved WHO or other GOARN partners*		15	12	27 (14%)
	That occurred outside of the host country*	27	22	24	73 (21%)
	That achieved measurable health impact		21	36	57 (29%)
	That qualified under IHR as a potential Public Health Emergency of International Concern (PHEIC)		10	16	26 (13%)
Pathogen Discovery	Pathogens discovered that were new to the world or region (cumulative)	3	14	34	34
	Pathogens for which testing capacity was significantly improved or established for the first time (cumulative)	11	29	69	69
Training	Senior epidemiologists trained (cumulative)	26	76	160	160
	Participants in short-term public health training	1,119	6,958	11,945	20,022
Surveillance	Total population under surveillance		3.5M	6.0M	6.0M
	Population under pneumonia surveillance		1.8M	4.6M	4.6M
	Centers with population-based pneumonia surveillance		3	5	5
	Centers with population-based surveillance projects		5	6	6
	Centers where surveillance data impacted policy		2	6	6

*Also contributes to "networking" activity area

Outbreak Response

Outbreak Response

GDD Regional Centers participate in outbreak response activities at the invitation of the Ministry of Health or WHO by providing technical assistance, epidemiology expertise, laboratory testing or consultation, and health communications support. In addition, GDD Centers can call upon the scientific experts at CDC headquarters when additional assistance, such as specialized laboratory testing or field deployment, is needed.

Accomplishments

Collectively, from 2006 to 2008 the GDD Centers assisted with 347 outbreaks (see graph on page 7) and other public health emergencies, including Rift Valley fever (Kenya – see story on page 7), the Sichuan earthquake (China – see story on page 7), cholera (Thailand), dengue hemorrhagic fever (Guatemala), anthrax (Kazakhstan), and human influenza A (H5N1) (Egypt).



Avian Influenza Response in 2007

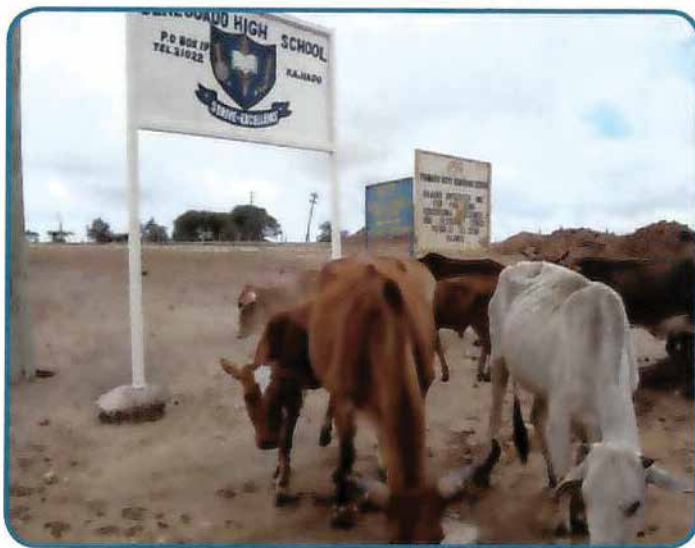
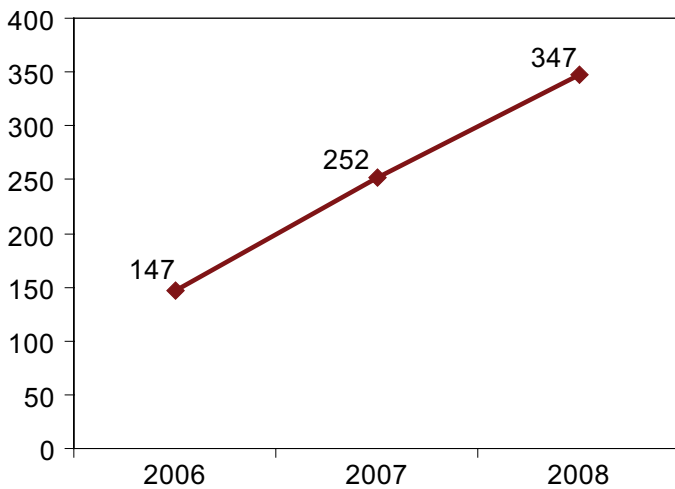


Disinfection team, Kampungu, Democratic Republic of Congo, Ebola Outbreak, 2007

GDD helps build national and regional capacity to ensure that outbreak responses:

- **Are Faster**
 - 81% received a response within 24 hours of the request
- **Are More Comprehensive**
 - 23% involved lab support, and of these, 79% led to a confirmed cause
 - Communications support tripled and epidemiology consultations doubled in 2008
 - 17% involved CDC headquarter support
 - 14% involved WHO or GOARN partners
 - 21% were in other countries of the region
- **Achieve Greater Health Impact**
 - 29% led to saving of lives, preventive action, or policy change
- **Prevent the Most Dangerous Threats**
 - 26 qualified under IHR as a potential Public Health Emergency of International Concern, defined by WHO as an extraordinary public health event that:
 - may have serious public health impact
 - is unusual or unexpected
 - has potential to spread internationally
 - may restrict travel or trade

Cumulative Number of Outbreak Responses, 2006–2008



Rift Valley Fever Outbreak, 2008



A glimpse of the destruction caused by the earthquake that struck Sichuan Province, China, in 2008.

Helping contain the spread of Rift Valley Fever

On June 9, 2008, a farmer in central Swaziland reported abortions of cattle to the central veterinary laboratory in Manzini. A liver specimen from the aborted fetuses tested positive for Rift Valley Fever virus. On August 11, the Ministry of Agriculture and Cooperatives in Swaziland requested assistance from GDD-Kenya through Kenya's Ministry of Health. A team comprised of medical and veterinary epidemiologists from the Government of Kenya, and laboratory experts from GDD-Kenya, including field epidemiology residents, provided surveillance, epidemiology, and specimen collection assistance to Swaziland's local and national agencies for two weeks. Animal quarantine and movement restriction interventions prevented human cases.

Mitigating Post-Earthquake Disease Spread

At 14:28 on May 12, 2008, an earthquake measuring 8.0 on the Richter scale occurred in Wenchuan, Sichuan Province, causing tens of thousands of deaths and injuries, widespread building collapses, road destruction, power and transportation disruptions, as well as massive economic loss. After the earthquake, the China CDC immediately sent teams to the disaster area. The China Field Epidemiology Training Program responded to the disaster by sending 21 officers to provide assistance to local agencies on disease prevention. They conducted field investigations and raised awareness about potential problems with diseases, drinking water, food, children's routine immunizations, treatment of trash and feces, among other threats. Their guidance aided in the organization of optimal response efforts in the disaster areas and mitigated potential disease outbreaks.

Pathogen Discovery

Pathogen Discovery

GDD Regional Centers are working to identify new pathogens (either to the region or to the world) and develop testing capacity that enables more rapid diagnosis and confirmation of emerging health threats and quicker implementation of appropriate response interventions.

Accomplishments

- Detected 34 pathogens that were new to the region or the world.
- 69 pathogens can now be identified locally, up from 11 in 2006.
- Because this capacity had previously been limited, it has enhanced disease detection and identification of appropriate response interventions.



Collecting samples for testing



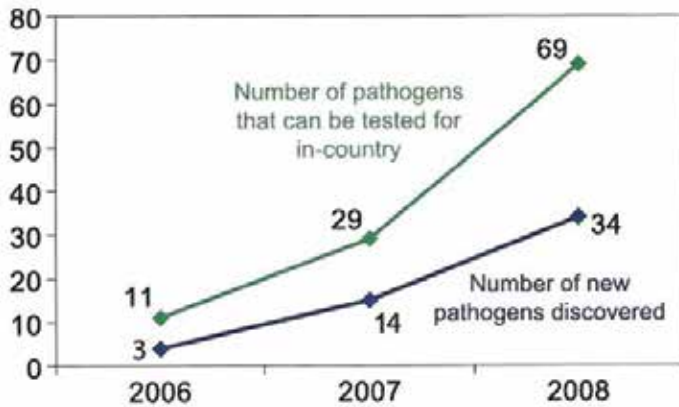
Laboratorian at NAMRU-3 in Egypt

Helping Identify Sandfly Fever Sicilian Virus

In September 2007, an outbreak of febrile illness occurred among U.S. Army troops in a rural patrol base south of Baghdad, Iraq. Soldiers had fever, headache, malaise, and myalgia. A total of 14 cases were identified. Laboratory tests performed at the NAMRU-3/GDD Regional Center in Egypt indicated that 13 of the 14 cases (92.9%) were positive for IgM antibodies to *Sandfly fever Sicilian virus*. This finding confirmed the presence of the virus.

Ellis SB, Appenzeller G, Lee H, et al. Outbreak of sandfly fever in central Iraq, September 2007. *Mil Med.* 2008; 173(10):949-53.

Cumulative Number of New Pathogens Discovered and Testing Capacity, 2006–2008



Selected New Pathogens Discovered, 2006–2008

GDD Center	Pathogen Name	New to
China	Tahyna virus	Region
Egypt	Sandfly fever Sicilian virus	Region
Egypt	New cholera genotype	World
Guatemala	Spotted fever-Rickettsia group	Region
Guatemala	Human metapneumovirus	Region
Kazakhstan	Dengue virus	Region
Kazakhstan	West Nile virus	Region
Kenya	Lagos bat virus	Region
Kenya	Adenovirus A 16 subtype	Region
Thailand	Bartonella tamiae	World
Thailand	Mumps virus, genotype J	Region

Discovering a Novel Bacterial Pathogen

A 38-year-old man in Northern Thailand sought treatment at his district hospital with fever that remained unexplained despite an extensive workup. The patient volunteered to enroll in a febrile illness study led by the late Dr. Tami Fisk and submitted blood for comprehensive laboratory testing. Special microbiologic techniques used at joint U.S. CDC/Thailand Ministry of Public Health laboratories in Thailand and at CDC's laboratories in Fort Collins, Colorado, led to the isolation of a novel bacterium. Analysis of the genome supported the placement of the bacterium within the genus *Bartonella* separately from all previously described species. This case was the first report of culture-confirmed *Bartonella* infection in humans in Thailand, and after the premature death of Dr. Fisk, the organism was named *Bartonella tamiae*. Further study has found that this pathogen is likely global in distribution.

Kosoy M, Morway C, Sheff KW, et al. *Bartonella tamiae* sp. Nov., a newly recognized pathogen isolated from three human patients. *J Clin Microbiol.* 2008;46(2):772-75.

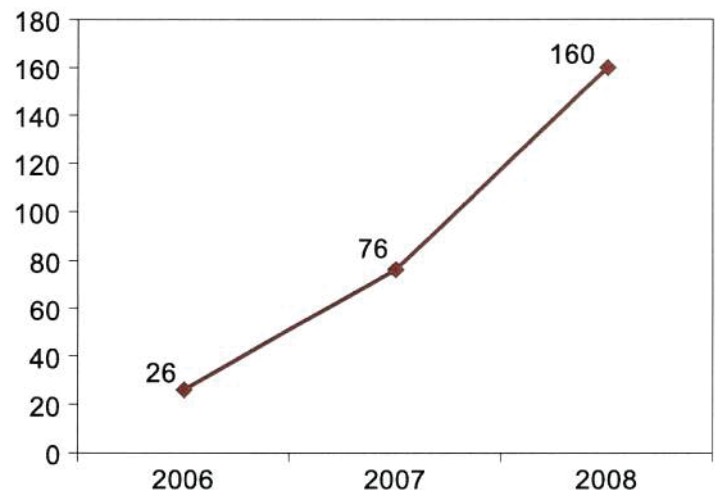
Training

GDD Regional Centers strengthen in-country and regional public health capacity for outbreak detection and response through short-term, classroom-based instruction and in-depth instruction and training of senior epidemiologists and laboratories through the Field Epidemiology Training Program (FETP).

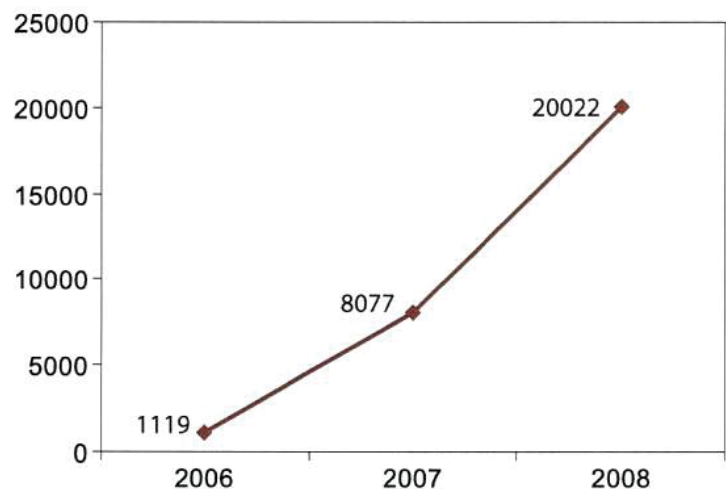
Accomplishments

- The number of FETP-trained senior epidemiologists and laboratorians within GDD Center regions increased from 26 to 160 over 3 years.
- Most of these epidemiologists serve in public health leadership positions within the host country after completion of the training program.
- More than 20,000 persons have participated in short-term public health trainings, a nearly 18-fold increase from 2006. Instruction has included a combination of advanced training for senior public health staff, as well as introductory training to those with limited public health experience.
- Short-term training topics include epidemiology, laboratory, all-hazards preparedness, risk communication, influenza and others.

Cumulative Number of Senior Epidemiologists, 2006–2008

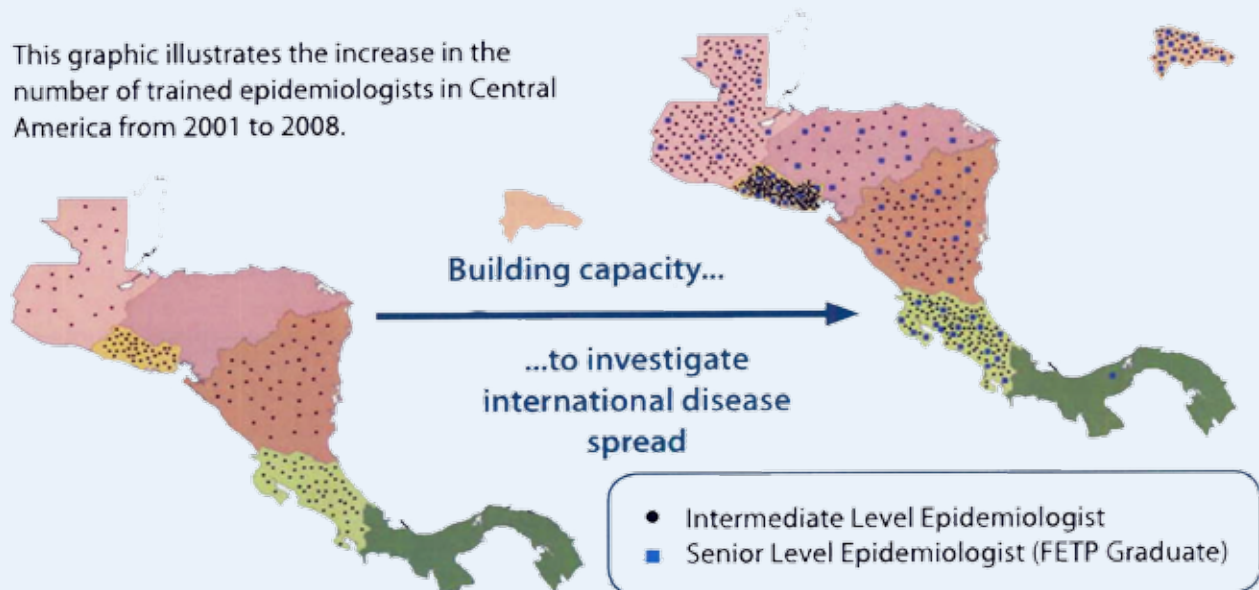


Cumulative Number of Training Participants, 2006–2008



Trained Field Epidemiologists in Central America

This graphic illustrates the increase in the number of trained epidemiologists in Central America from 2001 to 2008.



Salmonella Litchfield – Epidemiology Capacity Pays Off

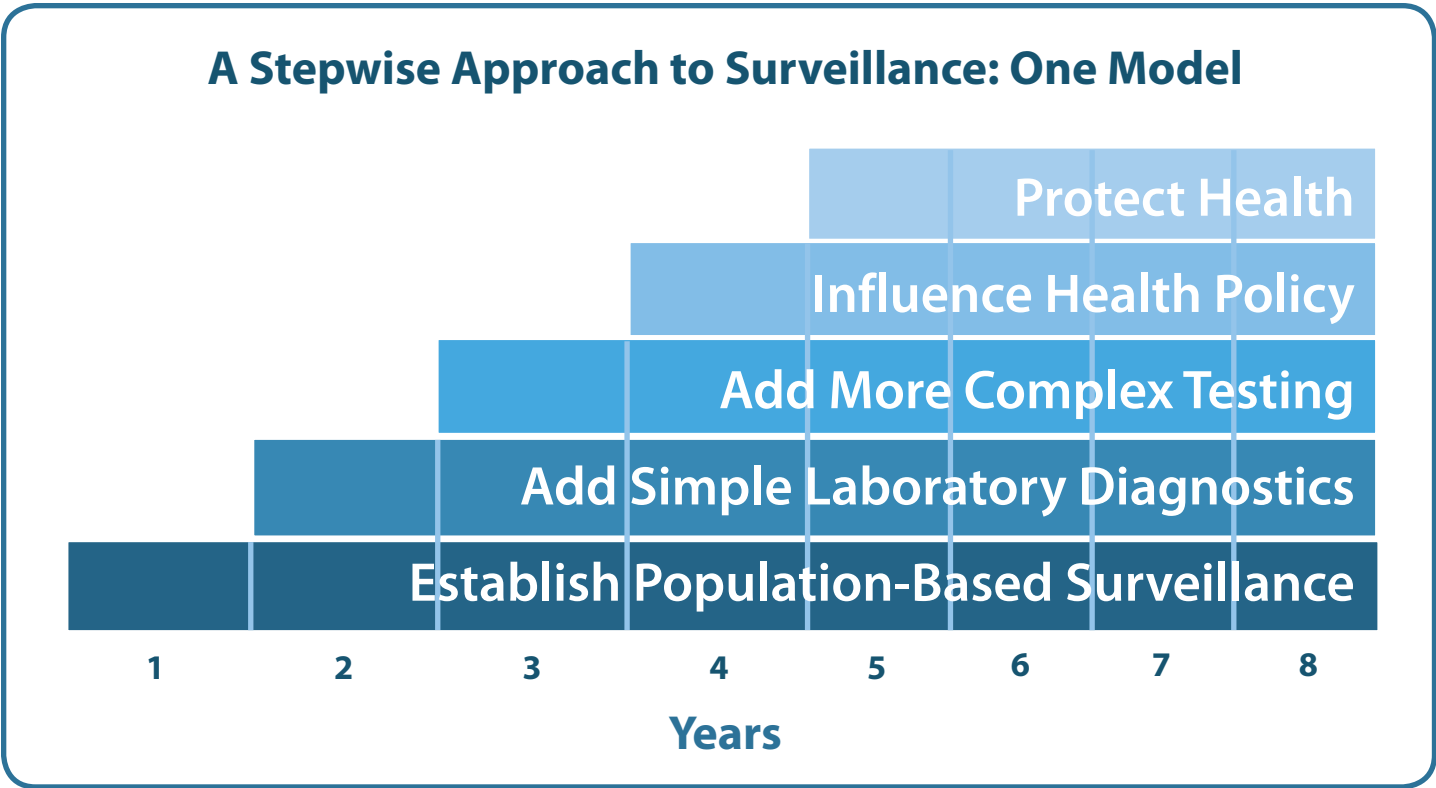
From January to April 2008, 51 persons in 17 U.S. states were infected with *Salmonella* Litchfield and at least 16 persons were hospitalized.¹ Interviews comparing foods eaten by ill and well persons showed that cantaloupe from Honduras was the likely source of the illnesses. An epidemiologist from GDD-Guatemala participated in the FDA-led team that investigated a Honduran exporting firm whose cantaloupe was associated with the outbreak. In the meantime, a graduate of the Field Epidemiology Training Program carried out an investigation for the Honduras Ministry of Health to determine if there were any cases in Honduras. GDD-Guatemala had discussions with the Honduras Ministry of Health regarding the outbreak and strengthening national food-borne disease surveillance. Continued capacity building and coordination of epidemiologic expertise in the United States and Central America can enhance the ability to prevent such outbreaks or contain them more quickly in the future.



1. Investigation Update: Outbreak of *Salmonella* Litchfield Infections, 2008, Centers for Disease Control and Prevention, Available at <http://www.cdc.gov/Salmonella/litchfield/>.

Surveillance

GDD Regional Centers follow a stepwise approach to developing sophisticated surveillance capacity. One approach (see figure below) begins with population-based surveillance, including an accurate case definition and then laboratory testing. The objective is to accurately define disease burden to influence public health policy, which leads to decreased morbidity and mortality.



An example of the stepwise approach in practice is described on page 13.

Accomplishments

- 4.6 million persons are under population-based surveillance for pneumonia in 5 GDD regions.
- 1.4 million persons are under population-based surveillance for other syndromes in 4 GDD regions.
- GDD Regional Centers are using surveillance data to detect outbreaks, make policy recommendations, evaluate new interventions, and measure public health effect.
- Household surveys of health utilization have informed development of surveillance methods suitable for each

Building Stepwise Surveillance in Thailand to Protect Against Influenza

In 2003, Thailand's Ministry of Public Health and CDC's International Emerging Infections Program established population-based pneumonia surveillance in Thailand.¹ One year later, nasopharyngeal swabs were collected and laboratory diagnostics were conducted to identify viral causes, including influenza. More complex testing was added later. Surveillance data were used to publish findings on incidence, cost, risk factors, and seasonality of influenza since 2003.^{2,3} Evidence of increased morbidity and mortality among seniors influenced the government to make a policy decision to invest in influenza vaccine for seniors. In 2008, the government doubled the number of vaccinations provided to about 600,000. In addition, a new government vaccine plant will be operational by 2011, eventually producing more than 10 million doses annually.⁴ This increased production will enable the country to vaccinate nearly one-sixth of its population, protecting them from an annual health threat that 10 years earlier was not a concern in Thailand.

1. Olsen SJ, Laosiritaworn Y, Siasiriwattana S, Chunsuttiwat S, Dowell SF. The incidence of pneumonia in rural Thailand. *Int J Infect Dis*. 2006;10(6):439-45.
2. Simmerman JM, Lertiendumrong J, Dowell SF, et al. The cost of influenza in Thailand. *Vaccine*. 2006;24(20):4417-26.
3. Katz MA, Tharmaphornpilas P, Chantra S, et al. Who gets hospitalized for influenza pneumonia in Thailand? Implications for vaccine policy. *Vaccine*. 2007;25(19):3827-33.
4. Thailand Commits to Seasonal Flu Shots for Seniors. CDC Global Health E-Brief. 2008;2. Available at <http://www.cdc.gov/washington/EGlobalHealthEditions/eGlobalHealth0708.htm>.



Going beyond clinical diagnosis: A nasopharyngeal swab for the Respiratory Pathogen Study, Thailand

Networking

Networking

The GDD Operations Center relies on a vast network of people to identify and confirm disease events. This network includes CDC subject matter experts in the United States, their international networks, CDC international staff based in more than 50 countries, and WHO staff in more than 140 countries. It also includes members of the Biosurveillance Indications and Warning Analytic Community (BIWAC), a USG interagency collaboration that allows 10 agencies to exchange unclassified information via a secure Web-based portal.

To facilitate rapid response, the GDD Operations Center has an outbreak fund to support travel, supplies, and shipping. The Operations Center also coordinates efforts with GDD Regional Centers and their network of governmental, nongovernmental, and private partners. The Operations Center facilitated and funded (approximately \$2 million) more than 20 significant responses to diseases such as avian influenza, cholera, Ebola (see story on page 15), Marburg, and Rift Valley fever during 2006–2008.



The GDD Operations Center, located in CDC's Emergency Operations Center (shown above), provides early warning about and rapid response to international health threats.

Coordinating a Response to Unexplained Deaths in Democratic Republic of Congo

On August 27, 2007, the GDD Operations Center picked up a media report and began to closely track news of unexplained deaths in the Democratic Republic of Congo (DRC). Early reports identified symptoms associated with a range of diseases, including typhoid, dysentery, gastrointestinal anthrax, and hemorrhagic fever. Initial detection of the disease was made more difficult because the remote village in which the cases were first identified had no health clinic.

CDC began exchanging information with WHO, and the local WHO office supported a field investigation by the Ministry of Health. The CDC office in DRC collaborated closely with the ministry and offered technical assistance when it was apparent that the outbreak posed a significant health threat.

GDD Operations Center staff worked quickly to collect and analyze (with support from CDC technical staff,) the data and sampling results, including WHO field reports. Staff set up conference calls to discuss possible causes including one with the medical director of the remote hospital where case-patients were going for treatment. These discussion strengthened the suspicion that the outbreak was being caused by a hemorrhagic fever. As a result of this discussion and other available data, the GDD Operations Center deployed Dr. Peter Kilmarx, a CDC physician who had previously worked in the area, to work with the Ministry of Health to conduct a field epidemiological and logistics assessment that would guide a larger response if required. After specimen tests were performed at CDC and a laboratory in Franceville, Gabon, the causative agent was confirmed as Ebola. CDC laboratories in Atlanta also determined that a large outbreak of typhoid was concurrently affecting the same population, and this outbreak had contributed to the difficulty in initially establishing a diagnosis.

CDC then coordinated the deployment of a team of nine scientists from its Special Pathogens Branch to assist in the field response. Over the next 6 weeks, the outbreak was controlled and eventually ended through the efforts of the DRC Institut National de Recherche Biomédicale, WHO, CDC, and other partners in the Global Outbreak and Alert Response Network (GOARN), including the nongovernmental organizations Doctors Without Borders and EpiCentre, as well as the Public Health Agency of Canada.



Since the 1970's, newly emerging diseases have been identified at the unprecedented rate of one or more per year . . .

It would be extremely naïve and complacent to assume that there will not be another disease like AIDS, another Ebola, or another SARS, sooner or later.

—*The World Health Report 2007. A Safer Future: Global Public Health Security in the 21st Century*

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